Appendix F: Trenchless Technology Costs

Trenchless Technology Unit Costs

Description	Unit	Tabula Dec 1999 Costs (Seattle ENR = 7137)	Tabula 9/05 cost based Seattle ENR CCI Index	Recommended Costs for input into Tabula	Resource Comparisons: Rinker Type 17 Import Material (Material Only)	Cadman Type 17 Import Material (Material Only)	Structural Excavation using KC Wage Rates	Confined Backfill with Compaction using KC Wage Rate	Spoils Hauling using KC Wage Rates	RS Means using KC Wage Rates	WSDOT June/2005 Excavation Inc Hauls	WSDOT Bridge Design Manual July/2005 (Exc inside shoring incl haul)	SPU 2002 Unit Cost Report (Exc incls Haul)	Tacoma P-5 Pipeline 8/02 (Excavation, Haul & Backfill)
Escalation/Location Factors			1.176										1.110	1.108
Pit Earthwork														
Shaft Excavation	CY	$25	$29.39	**$15**			$15.00		$10-$14		$12-$25	$22-$33	$23.87	$38.78
Shaft Native Backfill	CY	$25	$29.39	**$18**	$22.20	$26.83		$18.00						
Shaft Waste Haul	CY	$25	$29.39	**$12**	**Same as Pipe Haul Price (See Pipe Haul Backup)**									
Asphalt Pavement (See Pipelines)	CY	$50	$58.78	**$40**										
Existing Utilities (average)	SF	$6	$7.05	**$7**										
Existing Utilities (complex)	SF	$10	$11.76	**$12**										
Hydroseed	SY	$5	$5.88	**$5**							$2.50-$5.00		$4.00	

Trenchless Technology Dewatering Costs

Description	Unit	Tabula 9/05 cost based Seattle ENR CCI Index	Recommended Costs for input into Tabula		Resource Comparisons: Trench Sump Dewatering (2- 6" pumps attended)	Well Installation 40ft depth	Wellpoint Inst & Rmv per LF	Wellpoint Pump Operation	Tacoma P-5 Pipeline 8/02
Daily Rate					$1,271			$1,682	
Additional Pumps					$157				
Lineal Foot Cost to Install						$2,000	$50		
Microtunneling Dewatering									
2 shafts @ 1000' length									
Standard Dewatering		$47,000	**$50,000**		$42,977				
Significant Dewatering		$71,000	**$70,000**		$56,607				$156,675
3 shafts @ 2000' length									
Standard Dewatering		$53,000	**$55,000**		$42,977				
Significant Dewatering		$82,000	**$80,000**		$56,607				
4 shafts @ 3000' length									
Standard Dewatering		$59,000	**$60,000**		$42,977				
Significant Dewatering		$106,000	**$105,000**		$56,607				
5 shafts @ 5000' length									
Standard Dewatering		$71,000	**$70,000**		$42,977				
Significant Dewatering		$118,000	**$120,000**		$56,607				
5+ shafts									
Standard Dewatering		$88,000	**$90,000**		$42,977				
Significant Dewatering		$141,000	**$140,000**		$56,607				

Trenchless Technology Traffic Control Costs

Description	Unit	Tabula 9/05 cost based Seattle ENR CCI Index	Recommended Costs for input into Tabula		WSDOT June/2005	KC Wage Rate	
Hourly Rate	HR				$40	$48	
Traffic Control							
Standard	LS	$18,000.00	**$20,000**		$19,400	$22,406	45 days w/ 1 flaggers & misc signs, barriers, etc @ $5K
Heavy Traffic	LS	$29,000.00	**$35,000**		$33,800	$39,812	45 days w/ 2 flaggers & misc signs, barriers, etc @ $5K

Shafts can be a maximium of 1,000 ft apart.
Tunneling production is based on 35 lf/day based on historical project data.
Thus 1000lf @ 35ft/day equals 28+ days. Round up to 30 days.
Add 1 work week to open and 1 work week to close shafts.
Add 5 days for surface restoration misc other work items.

Microtunneling Unit Costs

Description	Unit	Tabula 9/05 cost based Seattle ENR CCI Index	Recommended Costs for input into Tabula	Resource Comparisons: Discussion w/ Bill Austell FCC of Microtunnel Costs	Tanner Creek-Phase 2 & 5 (2001)	Tolt Pipeline Micro-tunnels 5/99 (includes mob costs)[1]	Juanita Bay Pump Station 5/05	Clearview River Crossing 1/01	Tacoma P-5 Pipeline 8/02	Boeing Creek Storage Microtunnel Quote 1/05	Louisiana Tech Trenchless Technology Report Mid 2002
Escalation/Location Factors		1.176			1.145	1.210	1.024	1.139	1.108	1.028	1.108
Microtunnel Costs											
12 " Microtunnel ID											
MTBM Fixed Cost	LS	$106,000	**$120,000**	$135,000							
Microtunnel Cost ($/inch-diameter/lf)	$/dia-in	$35.27	**$40**	$39.00							$48.86
15 " Microtunnel ID											
MTBM Fixed Cost	LS	$118,000	**$130,000**	$150,000							
Microtunnel Cost ($/inch-diameter/lf)	$/dia-in	$32.92	**$37**	$36.40							$40.46
18 " Microtunnel ID											
MTBM Fixed Cost	LS	$141,000	**$160,000**	$180,000							
Microtunnel Cost ($/inch-diameter/lf)	$/dia-in	$31.74	**$35**	$35.10							$35.12
21 " Microtunnel ID											
MTBM Fixed Cost	LS	$165,000	**$190,000**	$210,000							
Microtunnel Cost ($/inch-diameter/lf)	$/dia-in	$30.56	**$32**	$33.80							$31.52
24 " Microtunnel ID											
MTBM Fixed Cost	LS	$188,000	**$210,000**	$240,000						$51,378	
Microtunnel Cost ($/inch-diameter/lf)	$/dia-in	$30.56	**$31**	$33.80						$64.22	$29.02
30 " Microtunnel ID											
MTBM Fixed Cost	LS	$235,000	**$270,000**	$300,000							
Microtunnel Cost ($/inch-diameter/lf)	$/dia-in	$29.39	**$30**	$32.50							$25.96
36 " Microtunnel ID											
MTBM Fixed Cost	LS	$294,000	**$330,000**	$375,000							
Microtunnel Cost ($/inch-diameter/lf)	$/dia-in	$28.21	**$29**	$31.20							$24.44
42 " Microtunnel ID											
MTBM Fixed Cost	LS	$353,000	**$400,000**	$450,000							
Microtunnel Cost ($/inch-diameter/lf)	$/dia-in	$27.04	**$28**	$29.90							$23.79
48 " Microtunnel ID											
MTBM Fixed Cost	LS	$411,000	**$470,000**	$525,000							
Microtunnel Cost ($/inch-diameter/lf)	$/dia-in	$25.86	**$27**	$28.60							$23.68
54 " Microtunnel ID											
MTBM Fixed Cost	LS	$470,000	**$540,000**	$600,000							
Microtunnel Cost ($/inch-diameter/lf)	$/dia-in	$25.86	**$27**	$28.60				$23.90			$23.94
60 " Microtunnel ID											
MTBM Fixed Cost	LS	$529,000	**$600,000**	$675,000			$102,392		$160,000		
Microtunnel Cost ($/inch-diameter/lf)	$/dia-in	$24.69	**$26**	$27.30			$26.22		$17.20		$24.45
66 " Microtunnel ID											
MTBM Fixed Cost	LS	$588,000	**$670,000**	$750,000							
Microtunnel Cost ($/inch-diameter/lf)	$/dia-in	$23.51	**$25**	$26.00							$25.15
72 " Microtunnel ID											
MTBM Fixed Cost	LS	$647,000	**$740,000**	$825,000							
Microtunnel Cost ($/inch-diameter/lf)	$/dia-in	$22.34	**$25**	$24.70	$18.16	$54.91					$25.98
84 " Microtunnel ID											
MTBM Fixed Cost	LS	$705,000	**$800,000**	$900,000							
Microtunnel Cost ($/inch-diameter/lf)	$/dia-in	$21.16	**$24**	$23.40		$45.54					$27.95

Notes

1 Tolt pipeline cost include Mobilization. 84" tunnel was 2,203 LF and the 72" tunnel was 392 LF.

Microtunneling Unit Costs

Carrier Pipe	Casing Pipe	Description	Unit	Tabula 9/05 cost based Seattle ENR CCI Index	Recommended Costs for input into Tabula		# / LF assuming of Steel Carrier Pipe	Pipe cost per # of Steel based on NW Pipe Quotes ($/#)
		Escalation/Location Factors		1.176				$1.00
12	24	" Diameter Casing Pipe	$/ft	$35	**$50**		50	$50.00
15	30	" Diameter Casing Pipe	$/ft	$59	**$65**		63	$63.00
18	30	" Diameter Casing Pipe	$/ft	$59	**$70**		71	$71.00
21	36	" Diameter Casing Pipe	$/ft	$71	**$90**		87	$87.00
24	36	" Diameter Casing Pipe	$/ft	$71	**$95**		95	$95.00
30	42	" Diameter Casing Pipe	$/ft	$92	**$120**		119	$119.00
36	48	" Diameter Casing Pipe	$/ft	$123	**$145**		143	$143.00
42	54	" Diameter Casing Pipe	$/ft	$176	**$220**		221	$221.00
48	60	" Diameter Casing Pipe	$/ft	$223	**$255**		253	$253.00
54	72	" Diameter Casing Pipe	$/ft	$282	**$285**		285	$285.00
60	72	" Diameter Casing Pipe	$/ft	$282	**$320**		318	$318.00
66	84	" Diameter Casing Pipe	$/ft	$423	**$520**		522	$522.00
72	84	" Diameter Casing Pipe	$/ft	$423	**$570**		570	$570.00
84	96	" Diameter Casing Pipe	$/ft	$517	**$665**		666	$666.00
90	108	" Diameter Casing Pipe	$/ft	$635	**$715**		715	$715.00
96	108	" Diameter Casing Pipe	$/ft	$635	**$760**		762	$762.00
108	120	" Diameter Casing Pipe	$/ft	$846	**$860**		859	$859.00
120	144	" Diameter Casing Pipe	$/ft	$1,234	**$1,270**		1,270	$1,270.00

Note: Microtunnel costs included the exterior pipe wall material. Added costs are actually for the carrier pipe within the cased pipe.

Bore Jack Costs

Description	Unit	Tabula 9/05 cost based Seattle ENR CCI Index	Recommended Costs for input into Tabula		Resource Comparisons: Louisiana Tech Trenchless Technology Report Mid 2002	Tunnel Systems Quote 10/05	Tacoma P-5 Pipeline Middle Reach 2/03	Tacoma P-5 Pipeline Kent-Covington 5/01	Everett Crosstown Pipeline 2/03	Hidden Lake Sewer B&J Quote 9/03	RS Means
Escalation/Location Factors		1.176			1.108		1.092	1.145	1.092	1.097	1.094
Bore & Jacking											
12 " Bore & Jack	$/dia-in	$32	**$20**		$19.00						
15 " Bore & Jack	$/dia-in	$29	**$18**		$17.47						
18 " Bore & Jack	$/dia-in	$28	**$17**		$16.87						
21 " Bore & Jack	$/dia-in	$27	**$17**		$16.81						
24 " Bore & Jack	$/dia-in	$27	**$17**		$17.08	$13.29					$14.24
30 " Bore & Jack	$/dia-in	$26	**$18**		$18.21						
36 " Bore & Jack	$/dia-in	$25	**$20**		$19.81	$13.75				$14.40	$12.70
42 " Bore & Jack	$/dia-in	$24	**$22**		$21.67					$13.06	
48 " Bore & Jack	$/dia-in	$24	**$22**		$23.70	$14.55					$11.41
54 " Bore & Jack	$/dia-in	$24	**$22**								
60 " Bore & Jack	$/dia-in	$22	**$23**								
66 " Bore & Jack	$/dia-in	$22	**$23**						$23.17		
72 " Bore & Jack	$/dia-in	$21	**$27**		$22.16		$27.58				
84 " Bore & Jack	$/dia-in	$21	**$28**					$28.18			
90 " Bore & Jack	$/dia-in	$20	**$28**								
96 " Bore & Jack	$/dia-in	$20	**$29**								
108 " Bore & Jack	$/dia-in	$19	**$29**								
120 " Bore & Jack	$/dia-in	$19	**$30**								

Horizontal Directional Drilling Costs

Description	Unit	Tabula 9/05 cost based Seattle ENR CCI Index	Recommended Costs for input into Tabula		Louisiana Tech Trenchless Technology Report Mid 2002
Escalation/Location Factors		1.176			1.108
Horizontal Directional Drilling					
6 " Horizontal Directional Drilling	$/LF	$60	**$60**		$42.88
12 " Horizontal Directional Drilling	$/LF	$180	**$180**		$87.16
15 " Horizontal Directional Drilling	$/LF	$270	**$270**		$120.37
18 " Horizontal Directional Drilling	$/LF	$380	**$375**		$160.95
21 " Horizontal Directional Drilling	$/LF	$470	**$470**		$208.92
24 " Horizontal Directional Drilling	$/LF	$530	**$530**		$264.27
30 " Horizontal Directional Drilling	$/LF	$630	**$640**		$397.10
36 " Horizontal Directional Drilling	$/LF	$750	**$750**		$559.44
42 " Horizontal Directional Drilling	$/LF	$890	**$890**		$751.31
48 " Horizontal Directional Drilling	$/LF	$1,010	**$1,000**		$972.69

Carrier Pipe	Casing Pipe	Description	Unit	Tabula 9/05 cost based Seattle ENR CCI Index	Recommended Costs for input into Tabula		$/LF Based on HDPE Pipe Cost
		Escalation/Location Factors		1.176			
6	12	" Diameter Casing Pipe	$/ft	$21	**$19**		$19.00
12	15	" Diameter Casing Pipe	$/ft	$31	**$31**		$31.00
15	18	" Diameter Casing Pipe	$/ft	$35	**$40**		$40.00
18	21	" Diameter Casing Pipe	$/ft	$51	**$47**		$47.00
21	24	" Diameter Casing Pipe	$/ft	$51	**$58**		$58.00
24	30	" Diameter Casing Pipe	$/ft	$94	**$91**		$91.00
30	36	" Diameter Casing Pipe	$/ft	$127	**$109**		$109.20
36	42	" Diameter Casing Pipe	$/ft	$165	**$127**		$127.40
42	48	" Diameter Casing Pipe	$/ft	$235	**$146**		$145.60
48	NA	" Diameter Casing Pipe	$/ft	$0	**NA**		